



DEPARTMENT OF SCIENCE AND TECHNOLOGY
PHILIPPINE COUNCIL
FOR INDUSTRY, ENERGY
AND EMERGING TECHNOLOGY
RESEARCH AND DEVELOPMENT
(DOST-PCIEERD)

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PCIEERD'S R&D MANAGEMENT: SUSTAINABILITY AND POLICY DIRECTION

Addressing Low Adoption of Environment Sector's
Project Outputs by Mandated National Agencies

PCIEERD's Environment Sector's Perspective

The Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) is one of the sectoral planning councils of the Department of Science and Technology (DOST). It covers 15 sectors under Industry, Energy, and Emerging technology and four sectors under special concerns including the environment.

The Harmonized National R&D Agenda (2017-2022) specifically on the industry, energy and emerging technology sectors laid the foundation of its R&D priorities. It focuses on the delivery of social services, and on environment and pollution control such as wastewater management, air pollution, and solid waste management. This is also in line with Goal No. 6 of the Sustainable Development Goals (SDG) which aims to ensure availability and sustainable management of water and sanitation for all. Specifically, it enshrines in the blueprint that by 2030, water quality will improve by reducing pollution, eliminating dumping and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally. (SDG 2030).

Notwithstanding the government's effort to curb environmental issues, still, the problem on environmental degradation persists. According to the 2020 Environmental Performance Index Ranking, as reported by Yale University, the Philippines ranks 111th among the 180 countries. It has drastically dropped from 66th in 2016 to 111th in 2020.

Fa, L.N. (2017) discussed that the issues of ecological damage and environmental pollution get worse and the total environmental interests get injured seriously because of the government environmental responsibility failure. This is due to the diversified interests of the involved parties. It added that the government and enterprises try to obtain more creative environmental interest from natural resources and pay more attention to the economic benefits brought by the environment. However, the public always pursue a better natural environment from their own welfare perspective.

The Philippine Development Plan 2017-2022 (PDP) provides policy direction through stricter implementation of existing legal frameworks that will be pursued to promote a clean and healthy environment. Strategies will focus on strengthening compliance with environmental standards and safeguards as well as developing, promoting, and adopting sustainable consumption and production (SCP) practices. These strategies will mitigate the negative environmental and health impact of economic activities. Chapter 11 of PDP further provides that stimulating innovation requires increasing investments for human resource development and infrastructure for developing science, technology and innovation (STI) ecosystem and fostering partnership among STI stakeholders.

Expenditures in R&D vs Adoption of Outputs

Based on the 2016 data compiled by the Philippine Statistics Authority (PSA), environment protection shares 0.0066% of the total public expenditure on R&D by sector. Whereas, the 2013 data on R&D expenditures by socio-economic objective and sector performance, only 728M was spent on Control and care of the environment representing 7% of the total R&D expenditures.

Ensuring Ecological Integrity, Clean and Healthy Environment

By 2022, the country will be cleaner and greener. Moreover, the quality of life of resource-based communities will be significantly improved.

Abridged Philippine Development Plan 2017-2022, NEDA

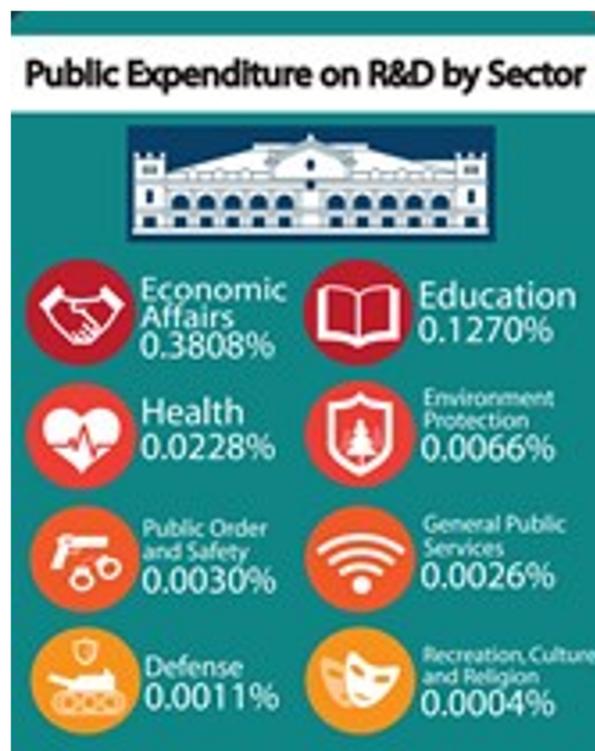


Figure 1. Public Expenditure on R & D Sector
Source: Budget of Expenditures and Sources of Financing (BESF) 2016

| Socio-Economic Objective | Sector of Performance | | | |
|---|-----------------------|------------------------|----------------|--------------------|
| | Government | Higher Education State | Private | Private Non-Profit |
| Exploration and exploitation of the earth | 16,942 | 2,177,137 | 10,545 | 0 |
| Infrastructure and general planning of land-use | 88,232 | 263,348 | 25,646 | 996 |
| Control and care of the environment | 43,871 | 493,911 | 121,688 | 68,182 |
| Protection and improvement of human health | 220,493 | 292,556 | 55,630 | 3,752 |
| Production, dist'n & rational utilization of energy | 41,521 | 45,309 | 21,475 | 0 |
| Agricultural production and technology | 2,089,681 | 960,041 | 22,543 | 23,815 |
| Industrial production and technology | 406,549 | 77,901 | 59,021 | 4,395 |
| Social structures and relationships | 78,880 | 178,489 | 172,420 | 15,389 |
| Exploration and exploitation of space | 482 | 1,195 | 0 | 0 |
| Defense | 139,811 | 90 | 0 | 0 |
| Access to information and knowledge | 977,041 | 83,433 | 44,529 | 6,288 |
| Others, not elsewhere classified | 618,306 | 236,008 | 19,384 | 8,151 |
| Not classified | 9,785 | 1,537 | 2,192 | 0 |
| Total RDE | 4,731,594 | 4,810,956 | 555,072 | 130,967 |

Figure 2. Socio-Economic Objective vs. Sectoral Performance
Source: Compendium of S&T Statistics, 2013

728M spent on Control and Care of the environment

Sector's Overview

Where are we now?

To date, there are ninety (90) completed projects under the environment sector covering 2011-2019. It represents about 5 percent of the total funds allocated to all PCIEERD sectoral coverage (see Figure 3 below) and rank no. 6 among other sectors in terms of R&D expenditures.

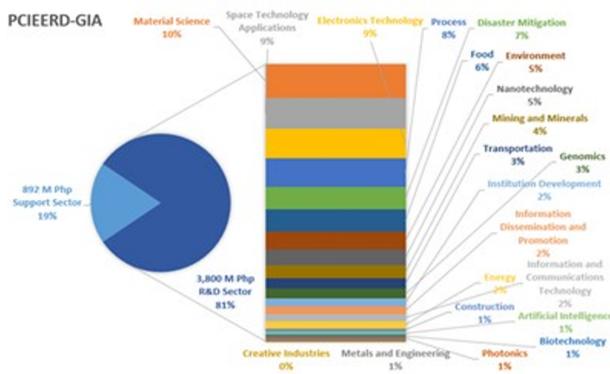


Figure 3. Fund Allocation to PCIEERD sectoral coverage

On the sector's yearly expenditures, the combined budget of PCIEERD and DOST GIA has dramatically increased in 2014 from rank 7th in 2011 to 3rd in 2014. This however dropped and unstable in succeeding years. The huge chunk of the pie of the total funds allocation primarily corresponds to the R&D priorities of the council as identified during the call for proposal period.

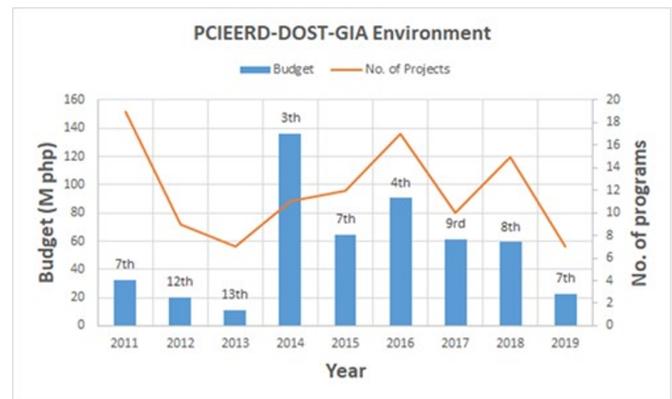


Figure 4. Projects under Environment Sector

In 2019 for instance, the Council's R&D priorities were aligned with the program areas identified in the HNRDA where PCIEERD directs R&D and S&T initiatives that will improve the innovation system to leverage economic progress. These R&D priorities are

1. Integrated and Intelligent Sensors and Actuators (IISA) for Intelligent Factories,
2. Smarter City development,
3. Novel Energy Design for Battery Energy Storage System,
4. Renewable Energy and Energy Efficiency,
5. SHIP's Ballast Water and Biofouling Treatment Systems for Marine Vessels (SAILS) Program, and
6. Programs related to Data Science.

However, the setting of priorities does not prevent the council to fund ongoing projects and other S&T initiatives that would have a scientific and socio-economic impact.

According to Lang (2003) research has two primary objectives: a) to build new knowledge, and b) to disseminate that knowledge and raise awareness of its potential applications. There exists an impressive array of technologies generated by researchers. However, despite some examples of successful technology adoption, many technologies remain un-adopted or adopted by a minority of potential users (NARO, unpublished, as cited in Butterworth, R., 2004). There are some indications that innovations pertaining to the protection of the environment have difficulty in accessing possible adopters more so in gaining success in the marketplace and in diffusing among potential customers, possibly more difficult than some other kinds of innovations have. This is relatively true for PCIEERD's environment sector's projects as it has a low adoption rate vis-à-vis sector's completed projects. Of the 90 completed projects, only 11 were commercialized, 15 are undergoing pre-commercialization and 30 are for further R&D and the rest are for publication and for information and dissemination (Fig. 5).

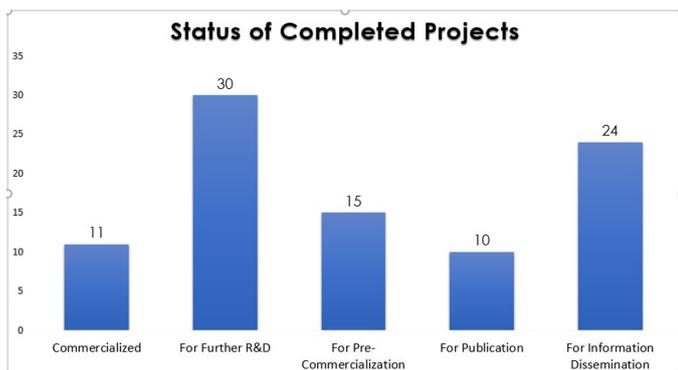


Figure 5. Status of Completed Projects

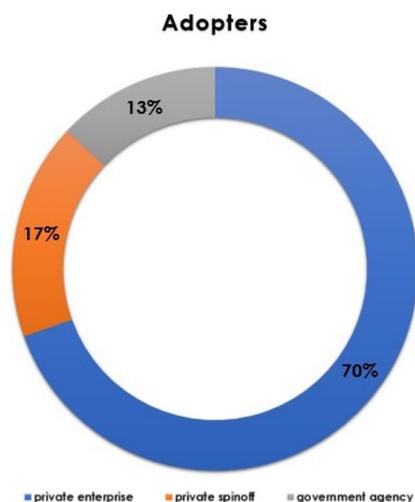


Figure 6. Innovation Adopters
Source: PCIEERD IMPACT program

The IP Management Program for Academic Institutions Commercializing Technologies (IMPACT), a program funded by PCIEERD with selected universities and RDIs with larger R&D grants shows that only 13% of the R&D outputs are adopted/used by government agencies (Fig. 6).

In the same manner, of the total project outputs of the environment sector, the majority is for support to policy and only 41% are commercialized and/or adopted representing 11% adopted by a private entity and 13% by mandated agencies and LGUs respectively. Nevertheless, it is interesting to note that for each technology there are also different takers/adopters of the technology be it as a private enterprise, a government agency, and an LGU as well (Fig. 7).

In the study of Bronwyn H. Hall and Beethika Khan on the adoption of new technology, they argued that the contribution of new technology to economic growth can only be realized when and if the new technology is widely diffused and used.

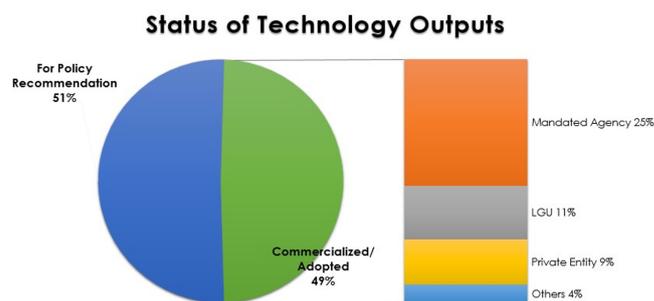


Figure 7. Status of Technology Outputs

To secure a truly harmonized R&D strategy within government, the DOST-PCIEERD has entered into several Memorandum of Agreements with National Government Agencies (NGAs) essentially to seamlessly integrate R&D efforts strategically and even fiscally (through co-implementation and co-funding of projects) as stipulated in HNRDA Industry, Energy and Emerging Technology sectors. In fact, the DOST-PCIEERD has straightened out its action plan on environment-related programs such as Integrated Mapping, Monitoring, Modeling, and Management System for Manila Bay and Linked Environments (IM4ManilaBay) and support to Manila Bay Rehabilitation Program in cooperation with various Local Government Units (LGUs) and NGAs such as DENR, LLDA, and MMDA to name a few.



The Role of Mandated Agencies

The role of agencies has expressed in several legislative and presidential enactments such as Presidential Decree no. 1586. The said P.D. established an Environmental Impact Statement (EIS) System specifically, Section 2 which states that "There is hereby established an EIS system founded and based on the EIS required, under Sec 4 of PD 1151, of all agencies and instrumentalities of the National Government, including Government Owned Companies and Controlled Corporations, as well as private corporations, firms, and entities, for every proposed project and undertaking which significantly affect the quality of the environment."

The Philippine EIS System (PEISS) is concerned primarily with assessing the direct and indirect impacts of a project on the biophysical and human environment and ensuring that these impacts are addressed by appropriate environmental protection and enhancement measures.

Salient provisions of the Philippine Clean Water Act of 2004 (Republic Act No. 9275) specifically sec. 24 provides that "Pollution Research and Development Programs -The Department, in coordination with the DOST, other concerned agencies and academic research institutions, shall establish a National Research and Development Program for the prevention and control of water pollution. This is also embodied in Department of Environment and Natural Resources (DENR) Administrative Order No. 2005-10 Implementing Rules and Regulations."

Overcoming barriers to collaboration

"the inability of most universities to be involved in R&D stems from the lack of enabling policies, opportunities, research leaders, and funding"

DOST SEC. FORTUNATO T. DELA PENA

Research and development initiatives are critical to driving product direction and continued success for the innovation ecosystem. This will be realized by taking an inclusive approach by strengthening the network with different stakeholders. This is further emphasized by Bader (2016) that collaboration provides R&D functions an edge by allowing for greater expertise and shared resources, which ultimately drive innovation and financial performance. Collaboration is an impactful method of increasing the quality of innovation while driving the industry forward as a whole. Secretary Fortunato T. Dela Peña declares in the special section of the Global Innovation Index 2020 that industry-academia collaborations for R&D are rare, despite the incentives offered by the government. He added that the inability of most universities to be involved in R&D stems from the lack of enabling policies, opportunities, research leaders, and funding.

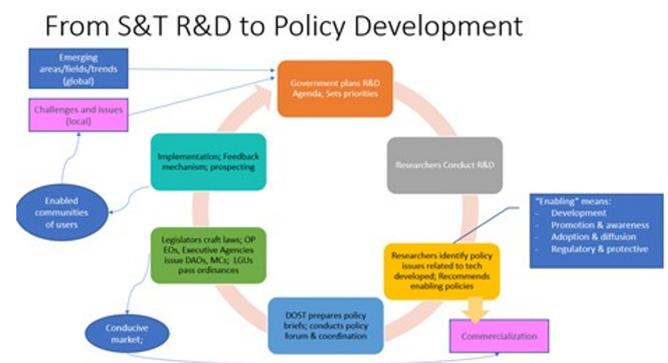


Figure 8. R & D to Policy Development Framework

The R&D to Policy Development Framework designed by PCIEERD Executive Director Dr. Enrico C. Parangit better explains the importance of enabling policies. From the government's setting of R&D priorities to researchers' R&D outputs leads to a recommendation of enabling policies and S&T based national legislation that eventually translates to commercialization (Fig. 8).

Recommended Policy Actions

1. A Cradle-to-Grave approach in project implementation – this is a functional model where stakeholders work together to push the innovation forward, from project proposal evaluation all the way to project outputs' adoption. To illustrate, during the approval phase of the project proposal, it undergoes a series of evaluation based on the DOST's monitoring and evaluation guidelines. Proposals recommended by the experts shall be endorsed by the Executive Director to the Governing Council who represents the government, academe, and the industry. During this phase, a representative from the mandated agency shall sit as a member of the governing board. This process will ensure that the project complies with the requisites of the mandated agency that will eventually adopt the project output.

2. Revisit sector's Roadmap - The roadmap shall serve as synchronized plans of the budget, time, and resources needed in the implementation of each of the sectors' S&T plan. These will also give a picture of the sectors' S&T directions for the succeeding years. A review of the existing roadmap shall validate whether its planned programs and strategies are still relevant to the current needs of the industry as well as to the government agencies' functions.

3. Engage government bodies that can regulate/impose policy reforms such as the National Economic Development Authority (NEDA), Local Government Units, and both chambers of congress. These agencies are responsible for crafting enabling policies necessary to carry out the objectives of the programs.

4. Reinvigorate Innovation Ecosystem - An innovation ecosystem is a term used to describe the various players, stakeholders, and community members that are critical for innovation (Millard, 2018). It includes universities, government, corporations, startup accelerators, venture capitalists, private investors, foundations, entrepreneurs, mentors, and the media. This collaboration among the players is critical in transforming new ideas into reality through access and financial investment.

References

Bader, B. (2016). Why R&D Is More Successful with Collaboration?. iNEMI International Electronics Manufacturing Initiative. Morrisville, NC 27560 USA.

Butterworth, R., et.al., (2004). Experience of Packaging Research Outputs into Extension Materials. National Agricultural Research Organization. Uganda Journal of Agricultural Science, 2004, : 1-8 downloaded from: <https://journalofchinesesociology.springeropen.com/articles/10.1186/s40711-019-0109-x>

Compendium of S&T Statistics, downloaded from: <https://dost.gov.ph/phocadownload/Downloads/Statistics/Compendium%20ST%20Statistics%20as%20of%20December%202015.pdf>

Cornell University, INSEAD, and WIPO (2020). The Global Innovation Index 2020: Who Will Finance Innovation? Ithaca, Fontainebleau, and Geneva.

Environmental Performance Index 2020 Global metrics for the environment: Ranking country performance on sustainability issues), downloaded from: <https://epi.yale.edu/downloads/epi2020report20200911.pdf>

Hall H. and Khan, B. (2002). Adoption of New Technology, New Economy Handbook. University of California at Berkeley, downloaded from: <https://eml.berkeley.edu/~bhhall/papers/HallKhan03%20diffusion.pdf>

Harmonized National R&D Agenda (HNRDA) 2017-2022. Downloaded from: <https://dost.gov.ph/knowledge-resources/downloads/file/791-harmonized-national-r-d-agenda-2017-2022.html>

Lang, M., (2003). Communicating Academic Research Findings to IS Professionals: An Analysis of Problems. Informing Science, Special Series. National University of Ireland, Galway.

LNFA, (2017). Causes analysis on the failure of government environmental responsibility—Based on the perspective of law and economics. IOP Conference Series: Earth and Environmental Science.

Philippine Statistics Authority, (2016). Budget of Expenditures and Sources of Financing (BESF). https://psa.gov.ph/system/files/R%26D%20of%20the%20Philippines_0.pdf?width=950&height=700&iframe=true

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